

ETHANOL SUPPLY OUTLOOK FOR CALIFORNIA

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Tom MacDonald
Gary Yowell
Mike McCormack
Mara Bouvier

Authors

Pat Perez

Manager

TRANSPORTATION FUELS OFFICE

Scott W. Matthews

Deputy Director

TRANSPORTATION ENERGY DIVISION

Robert L. Therkelsen

Executive Director

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Introduction

This report provides an updated summary of the California Energy Commission's (Energy Commission) ongoing investigations of California's near-term ethanol fuel supply picture. Results of a new 2003 U.S. ethanol industry production capacity survey comprise the primary component of the report. The status of ethanol production plans within California is discussed in a second section and, finally, the report describes foreign ethanol imports to California.

Since the 1999 Governor's executive order directing the phaseout of Methyl Tertiary-Butyl Ether (MTBE), and the subsequent determination by the California Environmental Policy Council that ethanol would be the only approved substitute, the Energy Commission has conducted evaluations of the state's ethanol supply options and prospects. A detailed survey of the U.S. ethanol industry's expansion plans was first undertaken and reported on in 2001 and updated in 2002. Additional activities have included studying in-state ethanol production potential and monitoring the progress of proposed California ethanol projects, as well as examining foreign ethanol supply potential.

Securing adequate supplies of ethanol for gasoline blending continues to be an important component of California's motor fuel supply planning. The state's phaseout of MTBE and substitution of ethanol is progressing toward completion by the end of 2003. With this transition from MTBE to ethanol, California has rapidly become the nation's largest market for ethanol fuel. In 2004, the state is expected to require between 760 and 990 million gallons of ethanol for gasoline blending, representing five to six percent of the state's gasoline supply.

Conclusions

U.S. Ethanol Industry Supply Sources

- Nearly all of California's ethanol fuel needs will continue to be supplied by U.S. ethanol producers, at least for the next few years.
- The U.S. ethanol industry continues to rapidly expand production capacity in response to increasing demand in California and other U.S. markets.
- Current industry expansion plans if realized would increase production capacity from today's three billion gallons per year to about six billion gallons per year by the end of 2006.
- U.S. ethanol production will continue to be concentrated in the Midwest corn-producing states; however, an increasing number of states are becoming ethanol producers, including states outside the Midwest.

California Ethanol Supply Sources

- California's production of ethanol will remain small relative to the state's ethanol supply needs through 2006.
- No new ethanol plant projects are under construction in California. However, a number of projects are in planning, some of which could begin construction and be in operation in the 2004 -2006 time period.

Foreign Ethanol Supply Sources

- Foreign ethanol imports will contribute a small share – possibly ten percent or less – of California's ethanol supply for the near term.
- There appears to be potential for increased future international ethanol trade, based on continuing growth in the number of worldwide ethanol producers and consumers.

Biomass-to-Ethanol Supply Sources

- Biomass-to-ethanol production from agricultural, forestry and municipal wastes and residues will make no significant contribution to U.S. ethanol supplies through 2006.

2003 U.S. Ethanol Production Capacity Survey

Major Findings

Since publishing the Energy Commission's survey findings in August 2001, several changes in the U.S. ethanol production industry have occurred:

- U.S. ethanol production capacity grew by 38% from 2001 to 2003, from 2.22 to 3.07 billion gallons per year, an increased of 870 million gallons per year.
- The number of ethanol plants in operation increased from 57 in 2001 to 69 in 2003.
- 16 new facilities are under construction that will add a total of 767 million gallons per year of capacity by the end of 2006.
- 50 planned projects were identified that, if built, could add about 2 billion gallons of ethanol capacity by the end of 2006.

- Five ethanol facilities with a combined capacity of 58.9 million gallons per year in 2001 are not currently producing ethanol.

Background

California refiners will complete the process of phasing-out the use of MTBE in California reformulated gasoline (CaRFG) by December 31, 2003 in accordance with Executive Orders issued by Governor Gray Davisⁱ. An adequate supply of ethanol, the only approved replacement for MTBE under California statutes, is essential for successful completion of the MTBE phaseout processⁱⁱ and assuring adequate supplies of gasoline to meet California demand.

Since completion of the Energy Commission's previous survey of ethanol industry production capacity in August 2001ⁱⁱⁱ, ethanol has been successfully introduced into CaRFG by most California refiners. Conoco Phillips proceeded in advance of the original MTBE phaseout date in 2002. About 100 million gallons of ethanol was blended into gasoline and sold by Conoco Phillips through stations in Northern and Southern California. This ethanol was blended at 5.7 volume percent in CaRFG.

In early 2003, ExxonMobil, ChevronTexaco in Southern California, BP and Shell commenced ethanol blending. With ChevronTexaco in Northern California, Valero and Tesoro completing their transition to ethanol by December 31, 2003, Energy Commission staff project ethanol use at roughly 550 millions blended into 65 percent of the state's gasoline supply in 2003.

In 2004, Energy Commission staff expect between 760 million and 990 million gallons of ethanol to be blended into California gasoline, corresponding to ethanol use in 80 to 100 percent of the state's gasoline supply. Given the federal minimum oxygen requirement, segregation limitations of the distribution infrastructure, and need of most refiners to identify replacement sources of octane that were lost with the phaseout of MTBE, continued use of ethanol is likely for some time into the future.

Goals of the 2003 Survey

The goals of the 2003 survey include:

- Identifying the nameplate capacity and expansion plans for existing U.S. fuel grade ethanol facilities through 2006,
- Identifying capacity under construction,
- Estimating the number and capacity of planned future facilities,
- Estimating fuel grade ethanol production volumes through 2006.

2003 Survey Approach and Process

Energy Commission staff developed a survey questionnaire in the summer of 2003 and distributed it to existing and prospective U.S. ethanol producers, trade associations, and several industry engineering/construction companies^{iv}. The new survey was developed by simplifying and refining the Energy Commission's 2001 Ethanol Production and Expansion Plan Survey. The 2003 Ethanol Production and Expansion Survey questionnaire is provided in Appendix A.

Survey participants were provided a sample letter that could be modified to suit company needs to protect confidentiality of data submitted to the Energy Commission. As with data provided to the Energy Commission in 2001, information provided by each existing and future ethanol producer is held confidential in accordance with specific requests of the participants.

Information Requested in Survey

Requested data in the 2003 survey included plant or company name, location (or proposed location of a future plant) existing and future nameplate capacity through 2006, as well as projected production volumes for 2003-2006. Ethanol production capacity for 2002 and share of fuel grade production were also requested. Participants were asked to provide the month and year of completion of plant capacity expansions and new plants.

The 2003 survey requested some new information not asked for in the 2001 survey. In addition, participants were asked to describe factors that, in their view, would cause future production volumes to deviate from projected volumes for 2004 through 2006.

Many of the technical details requested in the 2001 survey were not included in the 2003 survey, however, participants were asked to provide their 2002 ethanol yield data (gallons of ethanol per unit of feedstock processed). With corn the dominant feedstock for ethanol production in the U.S., gallons per bushel (of corn) is a key metric that can help determine the process efficiency of ethanol production.

Identification of Participants and Data Acquisition

Energy Commission staff utilized the contact list used in the 2001 survey as a starting point for identifying existing ethanol producers and plant locations, projects under construction and some planned projects (new entrants). Energy Commission staff sought assistance from industry trade organizations, state and local government entities, ethanol plant builders and technology developers, and conducted web searches to identify potential new entrants in the ethanol production business. In addition, a proprietary industry database was used. A telephone interview process with planned plant participants was the primary

method of communication used to complete survey forms for projects coming on-line primarily in 2005 and 2006.

In some instances, Energy Commission staff did not contact existing ethanol plants directly. Data for several existing and a few future plants was provided by the marketing organization for the ethanol plant (or group of plants) or by the builder of the facility (who may or may not have an ownership in the plant). In a few cases where no response to the survey could be elicited, information from the previous (2001) survey or from published sources was used.

Criteria for Inclusion of Production Capacity of Future Ethanol Plants in the 2003 Survey

Criteria for inclusion of planned ethanol production facilities in the 2003 survey are similar to the 2001 survey. In general, ethanol capacity was included if the project was scheduled to come on-line before the end of 2006 and exhibited the following characteristics:

- Existence of a business entity
- A selected site
- Identified capacity and feedstock
- Engagement of an engineering/construction firm
- A planned construction and start date
- Permitting process underway

Summary of Survey Results

Summary statistics for the 2003 survey are presented in Table 1 along with the corresponding statistics drawn from the Energy Commission's 2001 survey:

Table 1
Comparison of 2001 and 2003 Survey Results

	2001 Survey	2003 Survey
Number of Existing Plants (as of survey date)	57	69
Total Capacity of Existing Plants (MGY)	2,219	3,041
Number of Plants Under Construction (as of survey date)	13	16
Total Capacity of Under-Construction Plants (MGY)	387	767
Planned Plants included in survey (as of survey date)	34	50
Total Capacity of Planned Plants (MGY)	1,198	2,037
Number of Idle Plants (as of survey date)	n/a	5
Total Capacity of Idle Plants (MGY)	n/a	59
Projected Industry-Wide Capacity by end of 2003 (MGY)	4,018	3,211
Projected Industry-Wide Capacity by end of 2004 (MGY)	4,161	4,018
Projected Industry-Wide Capacity by end of 2005 (MGY)	4,427	5,465
Projected Industry-Wide Capacity by end of 2006 (MGY)	n/a	6,006
Number of Companies Included in Survey Results	84	119
Number of Companies with Operating Plants	44	55
Number of Additional Companies with Plants Under Construction or Planned	40	64
Number of States with Existing, Under-Construction or Planned Plants	26	30

MGY = million gallons per year

Year-by-Year Projected Capacity Comparisons

Figure 1 summarizes year-by-year projected growth in U.S. ethanol production based on the 2003 survey results. The results are broken down by existing plant capacity, planned expansions of existing capacity, new capacity under construction and capacity of new plants in planning stages. The most significant feature of the new survey is the growth in the number of planned facilities (50 – see Table 1) as well as the corresponding capacity growth which is projected to reach about 5.5 billion gallons in 2005 and six billion gallons in 2006. Capacity at the end of 2003 is projected to be 3.2 billion gallons.

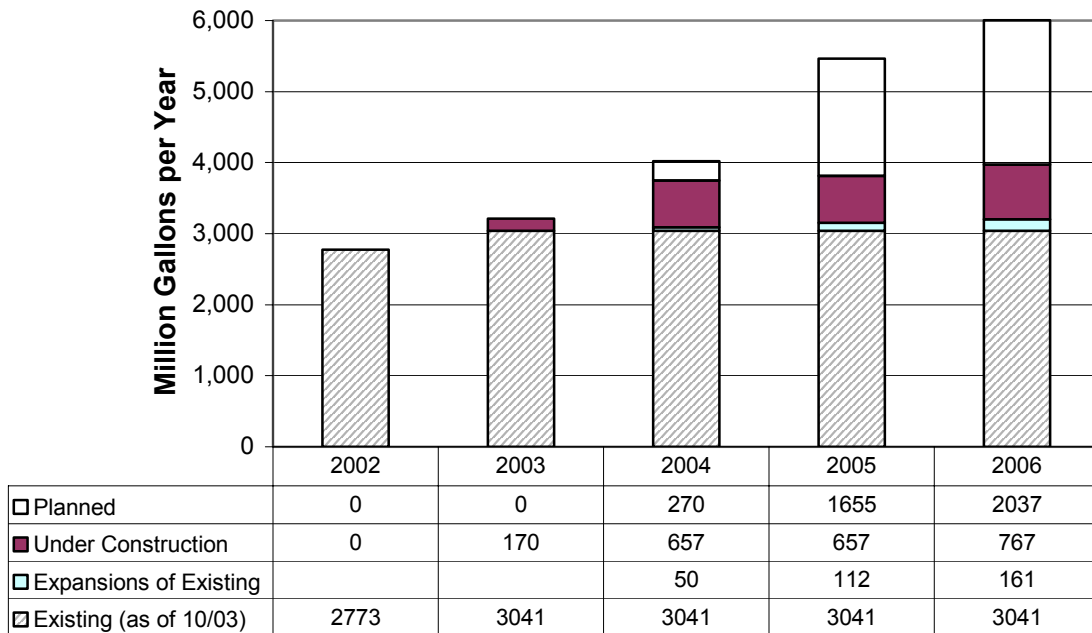
Table 1 presents comparisons between the 2001 and 2003 survey results. The 2001 survey projected an increase in nationwide capacity to 4 billion gallons in 2003, whereas, the new survey projects 4 billion gallons per year to come on line by the end of 2004. About 800 million gallons of projected new capacity in 2003 in the 2001 survey has been delayed by one year.

The 2003 survey which extends the forecasting horizon by one year reports an additional 1.4+ billion gallons in 2005 (from 2004) followed by another increase of 500+ million gallons in 2006. Relative to the 2001 survey results, the new survey

is projecting over a billion gallons per year more new capacity (5.5 versus about 4.4 billion gallons) in 2005. The only projections that appear to closely coincide between the two surveys are those for 2004 where the difference is only 143 million gallons per year. In this case, the 2001 survey is projecting a slightly higher production capacity.

Figure 1

Projected USA Ethanol Production Capacity @ End of Year



“Idle” Capacity

Five plants producing ethanol in 2001 or in construction in 2001 did not produce ethanol in 2003. About 59 million gallons per year of ethanol production capacity at five facilities is not currently in operation. Survey respondents cited market conditions and business decisions as the primary reasons for ceasing production. In this report, all capacity shutdown, but capable of restarting is “idle” capacity by definition. Idle capacity is excluded from production capacity totals appearing in all total capacity figures in the report. Some or all of this capacity could return to production status at some future date.

Projected Production Volumes and Yield

Survey respondents were asked to provide 2002 plant production volumes as well as estimated annual production volumes through 2006. Production data provided by existing plant operators was not comprehensive enough to report 2002 fuel grade ethanol production volume with a high degree of confidence. Of the responses with data, several reported production volumes for individual plants were in excess of nameplate capacity.

Regarding projected production volumes for 2004-2006, survey participants provided future year projected production volumes that closely matched production capacities after taking the new plant growth rate and mid-year start-up factors into consideration. Several participants projected future production of fuel-grade ethanol at volumes in excess of nameplate capacity or stated their intent to produce at higher than nameplate capacity once facilities were in place and operating.

15 existing plant operators provided ethanol yield data in their survey responses. All 15 were based on dry mill ethanol production with corn as the feedstock. Yield values in bushels per gallon of anhydrous ethanol were 2.55 to 2.84.

Ethanol Production Capacity by Region

Table 2 shows the regional distribution of the 2003 survey results by Petroleum Administration for Defense (PADD) Districts.^v This regional distribution was selected, in lieu of a state-by-state breakdown, as a further means of avoiding disclosure of information about any individual projects.

Table 2**Existing and Planned U.S. Ethanol Production Capacity by PADD^{vi}**

PADD District	Existing Capacity # of Plants	Capacity (million gallons per year)	Planned Capacity* # of Plants	Capacity* (million gallons per year)	All Capacity (2006) # of Plants	Capacity (2006) (million gallons per year)
District 1 (East Coast States)	0	0	9	487	9	487
District 2 (Midwest States)	61	2942	43	1820	104	4763
District 3 (Gulf Coast States)	1	26	6	230	7	256
District 4 (Rocky Mountain States)	5	64	4	218	9	282
District 5 (West Coast States + AK & HI)	2	9	4	209	6	218
Totals	69	3041	66	2965	135	6006

* Planned Capacity includes expansions of existing plants and plants under construction.
 Note: Some columns and rows may not add up due to rounding.

The summary by PADD shows that the Midwest region will remain the center of U.S ethanol production, with PADD 2 (the Midwest states) accounting for about one-half of planned new production capacity identified in the survey in 2006. Nearly 80 percent of the U.S. production capacity in 2006 will be in PADD 2, if planned facilities come on-line as scheduled. However, ethanol production is expanding into other regions of the country. Whereas a few Midwest states were once responsible for all U.S. ethanol production, today eighteen states produce ethanol. The survey results indicate that the number of ethanol-producing states could grow to as many as thirty by the end of 2006, with significant production capacity planned in PADD 1 (East Coast States) and PADD 3 (Gulf Coast States). Nevertheless, based on the survey results, the top five states in ethanol production by that time will all be Midwest states – Iowa, Illinois, Nebraska, South Dakota and Minnesota.

The number of U.S. ethanol-producing companies also continues to increase. While just a few companies owned all ethanol production capacity in the early years of the industry, there are now 55 companies in the country producing ethanol. This number could grow to as many as 119 companies by the end of 2006, according to the survey results, and the top three producers could represent about 25 percent of production capacity by that time, versus over 40

percent today. The survey also shows smaller plant sizes than in the past. A few plants in the 100 million gallons per year range are planned and one is under construction. According to survey results, the average capacity of 16 plants currently under construction is 40 million gallons per year. The 50 planned plants included as new capacity in the survey results have an average capacity of 41 million gallons per year.

Capacity that can be Diverted to Fuel-grade Ethanol Production

Survey participants were asked to report the percentage of production capacity that was fuel-grade ethanol in existing and planned facilities. However, Energy Commission staff did not receive sufficient data from survey respondents to allow an aggregated estimate of ethanol production capacity that might be diverted from industrial/beverage ethanol production to augment ethanol fuel grade ethanol supplies.

Outlook for Ethanol Production in California

Currently, California has two small ethanol producers, both located in the Los Angeles region. These two companies, both in operation for many years, produce a combined total of less than ten million gallons of ethanol per year. The raw materials used in these existing ethanol production plants are waste-products and residuals from food and beverage industry processes, either generated on-site or collected from other companies. Conventional fermentation/distillation technology is employed in both operations. See Appendix B for websites with further information on California's current ethanol producers.

Numerous plans and proposals have surfaced for new ethanol production facilities in the state. The Energy Commission has monitored the progress of these prospective ethanol projects, hosting presentations by or meetings with many of the proponent organizations and maintaining regular contacts with all known entities involved in any stage of ethanol project planning and development. Of the twenty project proposals or concepts brought to the Energy Commission's attention to date, none have broken ground nor are believed to have a firm commitment to begin construction at this time. Thus, no new ethanol production capacity within California is reflected in the overall U.S. ethanol production capacity outlook figures presented earlier in the report.

However, there are several proposed in-state ethanol production projects that have potential for near-term realization, and a number of other candidate projects that could follow if initial projects reach fruition. Energy Commission staff,

therefore, see the advent of at least some new ethanol production capacity in California as probable within the next few years.

California's ethanol production prospects can be divided into the following four categories:

1. Projects capturing the additional potential of food and beverage industry wastes and residues and certain types of agricultural industry residues and surpluses
2. Conventional corn-to-ethanol (and animal feed by products) projects
3. Sugar cane-to-ethanol (and byproducts) projects
4. Advanced technology biomass-to-ethanol projects using agricultural, forestry and municipal cellulosic wastes and residues

The status and prospects for project development in each of these categories is further described in the following sections. Some of the entities involved in prospective California ethanol projects have made their plans known to the public, while others have yet to make any public announcements. Therefore, no project or organization names are used in this report. The website links listed in Appendix B include some of the California ethanol project developers who have elected to release information about their plans.

Expansion of Ethanol Production from Food, Beverage and Agricultural Industry Wastes

Today's small production of ethanol from food and beverage industry wastes and residues is believed to have at least some potential for expansion. Several companies are actively exploring this option and additional ethanol is expected to be produced from such materials. California's cheese industry is one candidate industry where additional opportunities for ethanol production may exist. The wine, beer and soft drink industries may also have further potential for supplying feedstocks for ethanol production. Unusable and surplus components of certain agricultural crops, especially grapes and other fruits, offer additional untapped potential to supply materials for ethanol production.

The advantage of expanded ethanol production using the above types of materials is two-fold. First, as recycled materials, the feedstocks are typically available at low or no cost, or sometimes even earn a disposal fee, sometimes referred to as a "tipping fee". Second, ethanol production using these types of sugar- and starch-containing feedstocks uses conventional off-the-shelf processing technology that can be easily adapted to small-scale operations and placed in operation relatively quickly. Often, this type of ethanol production can be added at an existing food, beverage or agricultural industry processing facility.

A number of new or expanded operations producing ethanol from food and beverage industry residuals and surplus agricultural commodities are under

active consideration or development in the state. There is no reliable estimate at this time of the number of such facilities likely to be developed or their total production capacity. Neither has the statewide resource potential for this type of ethanol production been firmly estimated.

At least one new operation planned for the Central Valley, if successful, would become the state's third facility of this type producing ethanol. No other planned operations of this type are confirmed at this time; however, others are known to be under consideration. All production facilities of this type are expected to be relatively small in size – e.g. in the 10 million gallons per year range or less. Cumulatively, however, statewide development of this category of ethanol production, utilizing a high fraction of the available resources, could become a larger contributor to the state's ethanol supply.

Conventional Corn-to-Ethanol Production

Production of ethanol using the conventional dry-milling process used throughout the U.S. is likely to be the route to California's next substantial additions of ethanol capacity. Several corn-to-ethanol projects in the Central Valley are in advanced stages of planning. One of these projects may break ground by the end of 2003 and be in operation by the end of 2004. At least four additional Central Valley corn-to-ethanol plants are under active consideration, with tentative schedules that involve construction over the next two years. Several others are in more preliminary evaluation stages. All of these plants are in the 20 to 40 million gallons per year range. While it may be unrealistic to expect all of these projects to reach fruition, they cumulatively represent between 150 and 200 million gallons per year of corn-to-ethanol production capacity.

Some of the proposed Central Valley corn-to-ethanol projects have secured sites, are in permitting stages and have engaged engineering/procurement/construction firms. These path-breaking projects will be the first large ethanol projects to encounter what many perceive to be a highly-challenging California siting/permitting process for such facilities, or for new industrial facilities of any kind. Indeed some recent unexpected difficulties could delay groundbreaking for some of these plants.

Most of the proposed Central Valley corn-to-ethanol projects are located at existing grain operations that import corn to California from the Midwest for animal feed. These ongoing rail shipments of corn would comprise most of the feedstock for these initial facilities, supplemented by California-grown corn. The high-protein feed byproducts of the dry-mill corn-to-ethanol production would be supplied to nearby animal feed markets. The ability to supply this animal feed to markets near the production plant amounts to a considerable cost advantage from the avoided energy cost of the feed drying necessary for longer transport distances. This, plus the cost of shipping ethanol to California from existing out-of-state sources, represents the most likely route to cost-competitive ethanol

production in California at this time. Proponents of these projects intend to also shop for locally-produced corn, potentially expanding use of California corn in the future.

Planning for some of the Central Valley corn-to-ethanol projects includes an element of future biomass-to-ethanol production as the processing technology for such cellulosic feedstocks develops to the point of commercial availability. Major components of the ethanol production process would be common to use of both corn feedstock and cellulosic biomass feedstocks and, if sized and configured properly, could ultimately serve facility expansion to include production from cellulosic feedstocks. Electricity cogeneration is also attractive for some of these projects.

Sugar Cane-to-Ethanol Production

California could become the second largest world producer of ethanol from sugar cane, after Brazil, if plans being developed in the Imperial Valley are successful. Several Imperial Valley organizations are several years into laying the groundwork for an innovative sugar cane-to-ethanol industry in the Valley. With backing from the Imperial Irrigation District, feasibility studies completed to date demonstrate that Valley climate and agricultural conditions are ideally suited for sugar cane production. This, coupled with the Valley's existing (beet) sugar industry, and the region's depressed agricultural economy, in need of viable replacements for some traditional crops, makes a sugar-cane-to-ethanol industry appear increasingly attractive for the Valley. Support by the local community for this new industry appears to be growing, and establishment of the Imperial Valley Eco Park is underway to provide a designated development zone to support siting of the ethanol production facilities.

Years of sugar cane trials have been conducted and considerable Valley acreage is already being planted in sugar cane by an increasing number of growers who have subscribed to become producers of sugar cane to supply ethanol production. At this point, two sugar-cane-to-ethanol facilities are being actively proposed in the Valley, with others under longer-term consideration. The proposed projects, if built as planned, would become California's largest ethanol-producing plants, with capacities in the range of 50 to 100 million gallons per year. Electricity cogeneration, using the sugar cane plant residues as boiler fuel, would be used in these projects. Eventually, these projects could also add cellulosic biomass-to-ethanol production using plant residues as feedstock.

Imperial Valley sugar-cane-to-ethanol production is on a longer timetable than corn-to-ethanol production in the Central Valley, due mainly to the inherent sugar cane growth establishment cycle. Developing the seed cane and reaching the stage where a sufficient crop of mature harvestable sugar cane adequate to support full-scale ethanol production will require several years. The plant designs being developed, while able to borrow from established sugar-cane-to-

ethanol production by the Brazilian industry, are still new relative to existing U.S. corn-to-ethanol technology, and have higher financing costs with the inclusion of electricity cogeneration. Thus, there are currently no firm schedules for the proposed Imperial Valley sugar-cane-to-ethanol projects. The earliest one of these plants could be producing ethanol is probably 2005-2006.

Biomass-to-Ethanol Production

Originally envisioned as California's primary approach to ethanol production, biomass-to-ethanol remains an unfulfilled promise. Progress in the development of process technology for producing ethanol from cellulosic biomass materials has not met past goals, and no process suitable for commercial application is yet available. However, there are numerous process developers in active stages of research and development, and expectations remain high that some of these processes will prove viable for application to potential California projects. A number of biomass-to-ethanol projects around the state remain under active consideration, with the possibility that California could still be home to one of the first facilities of this type.

The Energy Commission has monitored the activities of some twenty different organizations pursuing a process technology for producing ethanol from biomass wastes and residues. An April 2003 ethanol workshop in Sacramento included presentations by eight of these organizations (see website link at bbiethanol.com in Appendix B). Potential California applications of their processes are under consideration by some of these technology developers. Most are at stages of development that require a demonstration or pilot-scale application prior to building a commercial facility. Two basic types of process technology are being actively pursued. Processes using acid hydrolysis or acid/enzymatic hydrolysis are most numerous. Several developers are pursuing gasification-based technologies.

Biomass-to-ethanol projects under consideration in California include projects that would use municipal waste materials, agricultural waste materials and forestry residues as feedstocks. Of these, the furthest along at this point with respect to project development plans, appear to be municipal waste-to-ethanol projects. At least one company is in the permitting stage for a demonstration of a hydrolysis-based municipal waste-to-ethanol process at a waste recycling facility in California. Other companies are seeking locations in California for similar projects. If plans proceed on schedule, the first of these municipal waste-to-ethanol demonstration projects could be in operation in 2004.

The Energy Commission, in partnership with the U.S. Department of Energy, has participated in feasibility studies for two potential Northern California projects that would produce ethanol from agricultural and forestry residues. Both of these projects were originally intended for collocation with existing biomass electric generating plants. The feasibility studies, involving potential application of one

developer's acid hydrolysis process, did not result in a viable technology for application in either project. Therefore, these projects do not presently have operative timetables for completion; one is actively evaluating other process technologies while the other is on indefinite hold pending development progress with other candidate technologies. Meanwhile, some of the work that was completed on behalf of these projects includes siting feasibility and environmental studies, feedstock supply studies and preliminary engineering evaluations.

Since a number of potential ethanol projects using conventional starch- and sugar-based processes and feedstocks now appear likely in California, recent interest has focused on possibilities for incorporating early biomass-to-ethanol processes, on a pilot-scale, testing or "pre-commercial" basis, as part of one or more conventional ethanol production facilities' plans. This approach could significantly reduce the cost of proving the commercial viability of biomass-to-ethanol process technologies, as compared to constructing a stand-alone facility. However, no firm plan for incorporating such a biomass-to-ethanol development facility in any proposed conventional ethanol project has been identified.

Outlook for Foreign Ethanol Imports to California

California's fuel supply has included some foreign ethanol deliveries via marine tanker on an irregular basis over several decades. Shipments of imported ethanol are contributing to the state's current ethanol supply, and there are increasing prospects for foreign sources of supply to the state in the future. Traditionally, ethanol has not been a widely-traded commodity on an international basis, with most ethanol consumed within the few producing countries. This situation appears destined for major change as more countries become ethanol producers and consumers and the potential benefits of international ethanol trade become realized.

Since beginning its national ethanol program in the late 1970s, Brazil has been the world's largest ethanol producer and the source of most of the limited ethanol imports to the U.S and California. Imposition of a U.S. ethanol import tariff in 1980, designed to protect domestic producers from lower cost foreign sources, severely constrains direct imports of ethanol from Brazil to this country. However, the Caribbean Basin Initiative (CBI), enacted in 1984, has provided an indirect route for ethanol from Brazil and other sources to reach the U.S. tariff-free on a limited basis. This is the means by which foreign ethanol is supplied to California today and in the foreseeable future.

The CBI guidelines allow ethanol that has value added in qualifying countries – including most Caribbean and Central American countries – to enter the U.S tariff-free, up to a maximum of seven percent of the U.S. ethanol market. This seven percent market share, which amounts to a significantly increasing volume

of ethanol with the current growth of the U.S. market, has never been fully realized. In 2003, industry sources expect CBI-origin ethanol imports to the U.S. to be about 65 million gallons, up from about 46 million gallons in 2002. About 45 million gallons of the 2003 CBI imports are expected to come to California. The 2003 estimated CBI imports to the U.S. amount to only 3 percent of 2002 U.S. ethanol consumption. Thus, there is room under the existing CBI cap for considerable increases in tariff-free imports of ethanol reprocessed in qualifying CBI countries. And the import cap on reprocessed CBI ethanol, presently at about 150 million gallons per year, will increase to about 350 million gallons per year if the U.S. ethanol fuel market grows to the 5 billion gallons per year level envisioned under a proposed national renewable fuels standard.

Currently, the ethanol fuel reprocessing capacity in CBI countries, necessary to meet the value-added requirement, is the limiting factor on CBI imports. In-place CBI reprocessing capacity stands at only 90 million gallons per year, comprised of four dehydration plants in Costa Rica, El Salvador and Jamaica. However, expansion of this capacity is currently underway, with further potential for future expansion. Furthermore, the CBI guidelines allow additional imports of ethanol produced indigenously in CBI countries, beyond the seven percent cap on value-added reprocessed ethanol. While there appear to be only very limited plans for such indigenous production in CBI countries at present, this potential is being evaluated in a number of these countries, and could ultimately be substantial. In 2004, with no indigenous supplies expected and only a small expansion of reprocessing capacity completed, CBI ethanol imports to the U.S. are estimated to reach about 100 million gallons per year, with about 50 million gallons per year of this destined for California. Plans being considered for new or expanded CBI reprocessing facilities in Panama, Costa Rica and Trinidad-Tobago could result in a doubling of CBI capacity in succeeding years.

Besides Brazilian ethanol, the only other significant originating source for ethanol reprocessed via the CBI for import to the U.S. has been surplus ethanol from the European wine industry. This European wine ethanol has never made up a large fraction of CBI imports and has recently declined to virtually nil as a result of restrictions imposed by the World Trade Organization.

Beyond CBI ethanol imports, the other possibilities for foreign ethanol imports to California are: (1) tariff-free imports from countries covered by the North American Free Trade Agreement (NAFTA), the Andean Trade Preferences Act or other free trade agreements, and (2) imports that include payment of the U.S. import tariff. Of the NAFTA partners, Canada and Mexico, Canada is in the midst of a major national ethanol production expansion program. Canada has a near-term target of tripling its ethanol production industry, which would result in about 200 million gallons per year of capacity. However, Canada also has plans for expanded internal use of ethanol that may largely account for the increase in domestic production. Nevertheless, some Canadian ethanol is currently being supplied to markets in the U.S. Pacific Northwest, and imports from Canada to

the California market are not out of the question. Potential for Mexican ethanol production has been under evaluation, and at least one proposed project in Mexico reached the Energy Commission's attention in recent years. However, there are no committed projects for new ethanol production in Mexico at the present time.

The Andean Trade Preferences Pact grants preferential tariff status for the major exports of Peru, Colombia, Bolivia and Ecuador in exchange for fighting narcotics production. Thus far, none of these countries has become a significant producer or exporter of ethanol, although this is a future possibility, with ethanol production potential being explored in at least two of these countries, Columbia and Peru. Other countries that may be eligible for tariff-free importation of products, including ethanol, to the U.S. include the Least Developed Countries, a group of 49 African, Asian and South Pacific nations, as well as Israel and Jordan. However, there are no known plans to develop significant ethanol fuel production industries in any of these countries at this time.

Brazilian ethanol producers have repeatedly expressed interest in supplying an increasing share of California's expanding ethanol market. With over four billion gallons per year of ethanol production capacity, Brazil often has excess supply capability that could serve California. And Brazil's ethanol production capacity is expected to grow, with both new industry entrants and expansions by existing producers. However, even as the world's lowest-cost ethanol producers, Brazilian companies could not match current U.S. producers' prices after payment of the import tariff, which currently stands at \$0.54 per gallon. Thus, Brazil appears resigned to remain an ethanol supplier to the U.S. only to the extent of the tariff-free quota of the CBI for the foreseeable future.

Meanwhile, many other countries around the world, ranging from Thailand to Sweden, are undertaking major national ethanol production programs. Most of these are matched with domestic usage programs, although some are also exploring potential export markets. Japan is becoming an increasing consumer of ethanol fuel, relying mostly on imports. In the longer term, it appears likely that ethanol will become an increasingly-traded international energy commodity, accompanied by international commodity exchange postings and transactions among more supplying and consuming countries. In this type of long-term market picture, it is reasonable to foresee California ultimately becoming a more prominent participant in an expanding world ethanol market, potentially as both an importer and exporter.

ⁱ Governor Davis issued Executive Order D-5-99 on March 25, 1999 banning the use of MTBE in California gasoline due to environmental risks associated with contamination of groundwater and drinking water resulting from leaking underground gasoline storage tanks. The original ban date was extended by one-year to December 31, 2003 by Governor Gray Davis under a second Executive Order issued on March 15, 2002.

ⁱⁱ California law requires any proposed new fuel or fuel additive to undergo a multi-media environmental review process to qualify as a legal fuel or fuel additive, The California Environmental Policy Council must

determine no significant adverse environmental impact with proposed use after peer review and public comment of reports prepared by the California Air Resources Board, the State Water Resources Control Board and the Office of Environmental Health Hazards Assessment. The EPC made this determination for ethanol as a blending component and substitute for MTBE in CaRFG3 gasoline on January 18, 2000.

ⁱⁱⁱ “U.S. Ethanol Industry – Production Capacity Outlook”, Energy Commission report P600-01-017, August 29, 2001 with updates in July and December 2002 can be viewed at http://www.energy.ca.gov/reports/2001-08-29_600-01-017.PDF

^{iv} The survey forms and cover letter were distributed to about 100 recipients on July 23, 2003. Additional forms were distributed in August as Energy Commission staff became aware of new construction and planned future plants.

PADD I:	PADD II:	PADD III:	PADD IV:	PADD V:
Connecticut	Illinois	Alabama	Colorado	Alaska
Delaware	Indiana	Arkansas	Idaho	Arizona
District of Columbia	Iowa	Louisiana	Montana	California
Florida	Kansas	Mississippi	Utah	Hawaii
Georgia	Kentucky	New Mexico	Wyoming	Nevada
Maine	Michigan			Oregon
Maryland	Minnesota			Washington
Massachusetts	Missouri			
New Hampshire	Nebraska			
New Jersey	North Dakota			
New York	Ohio			
North Carolina	Oklahoma			
Pennsylvania	South Dakota			
Rhode Island	Tennessee			
South Carolina	Wisconsin			
Vermont				
Virginia				
West Virginia				

^{vi} PADD Districts are Petroleum Administration for Defense Districts, Delineated by the federal government to facilitate allocation of petroleum fuels.

APPENDIX A

2003 Survey Questionnaire

Company: Name: _____ Address: _____ Date: _____

Respondent Name & Title: _____

Phone: (____) _____ Fax: (____) _____ E-mail: _____.

Part 1 Existing Facilities, Expansions and estimated production

Plant Name	Plant Location (City/State)	% fuel grade	Capacity / Production (million gallons per year)										Expansions	
			2002 Capacity	2002 Production	2003 Capacity	2003 Production	2004 Capacity	2004 Production	2005 Capacity	2005 Production	2006 Capacity	2006 Production	1 st Expansion Completed (month/year)	2 nd Expansion Completed (month/year)

Part 2 New Facilities, Expansions and estimated production

Plant/Company Name	City / State	Constructi on Start Date	Opera- Constr uction Date	% Fuel Grade	2003 Capacity	2003 Production	2004 Capacity	2004 Production	2005 Capacity	2005 Production	2006 Capacity	2006 Production	1 st Expansion Completed (Month/year)	2 nd Expansion Completed (Month/Year)

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1. Feedstock(s): Corn____ Milo____ Wheat____ Barley____ Other
(describe)_____

2. 2002 yield (gallons per bushel): _____, other (specify units)_____

3. Describe factors that would delay (or advance) the schedule for construction of new
facilities or expansion of existing facilities

4. Describe factors that would cause future production volumes to increase or decrease
relative to projected volumes

5. For facilities capable of switching to fuel grade production, what factors cause this to
occur in your facility? Volume (GPY)?

APPENDIX B

Website Links for Further Information

Websites with information on U.S. ethanol industry supply sources:

American Coalition for Ethanol
www.ethanol.org

BBI International (ethanol consultants)
www.bbiethanol.com

Ethanol Producers and Consumers
www.ethanolmt.org

Governors Ethanol Coalition
www.ethanol-gec.org/

National Corn Growers Association
www.ncga.com

Renewable Fuels Association
www.ethanolrfa.org

Websites with information on California ethanol supply sources:

Arkenol
www.arkenol.com

California Energy Commission
www.energy.ca.gov/ethanol/index.html

California Ethanol Workshop, April 2003
www.bbiethanol.com/doe/conference.cgi?doeid=45

Golden Cheese Company of California, Corona, CA
<http://ourworld.compuserve.com/homepages/gccc/>

Imperial Bioresources, LLC
www.imperialbioresources.com

Imperial County Community and Economic Development
www.icced.com

Northern California Ethanol
www.northerncaliforniaethanol.com

Parallel Products, Rancho Cucamonga, CA
www.parallelproducts.com

Sierra Economic Development District
www.sedd.org/biomass_to-ethanol.htm

Websites with information on foreign ethanol supply sources:

ED & F Man Alcohols (International Ethanol Trading Company)
www.edfman.com/alcohols

F.O. Licht (International Ethanol Consulting and Reporting Firm)
www.fo-licht.com

Murtaugh & Associates – Online Distillery Network for Distilleries and Fuel Ethanol Plants Worldwide
www.distill.com

UNICA – Sao Paulo (Brazil) Sugarcane Agroindustry Union
www.unica.com.br